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(54) Fertilizer from seaweed

(57) A liquid fertilizer is produced from particulate artificially dried seaweed by

(a) soaking the seaweed in water for from 2 to 12 hours;

(b) subjecting the soaked seaweed to pressure in order to pulp it and facilitate liquefaction,

(c) heating the resulting pulp with water under pressure for a period of time, preferably not exceeding six hours, that will cause the bulk of the nutrients to pass into solution, leaving a residue, and

(d) separating the residue from the solution and preferably subjecting it to pressure to expel liquid from it.

The extract obtained in step (c) is normally mixed with the liquid expelled in step (d) to provide the liquid fertilizer product: the pressure in steps (b) and (d) may be applied by rollers.

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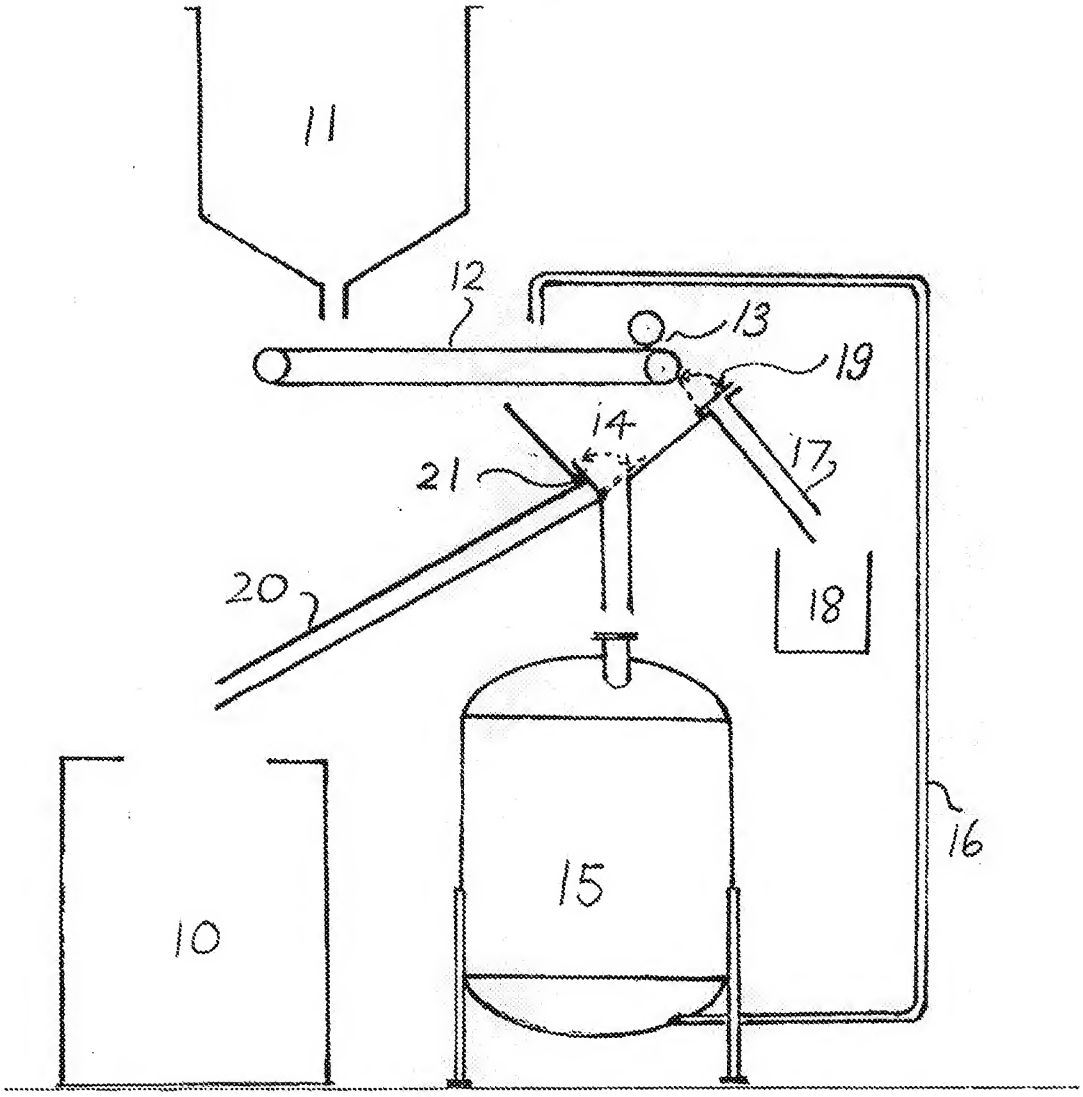

SPECIFICATION

Fertilizer production

This invention relates to the production of fertilizer from seaweed. Seaweed contains not only the principal plant nutrients NPK (nitrogen, phosphorus and potash) but also many valuable trace elements including sulphur, the halogens chlorine, bromine and iodine, copper, cobalt, iron, magnesium, manganese, molybdenum, sodium, zinc and boron.

It is known that a liquid fertilizer can be produced from seaweed by heating it above 100°C under superatmospheric pressure, preferably under agitation, with an aqueous solution of a suitable extracting agent such as sodium or potassium bicarbonate. Most of the nutrients pass into solution and the resulting residue is filtered off. (See U.K. Patent No. 661,989, published in 1952). The seaweed used may be particulate (e.g. milled) artificially dried seaweed.

In accordance with the present invention, a liquid fertilizer is produced from particulate, e.g. milled or granular, artificially dried seaweed by

(a) soaking the seaweed in water for from 2 to 12 hours;

(b) subjecting the soaked seaweed to pressure, preferably by passing it through rollers, in order to pulp it and facilitate liquefaction,

(c) heating the resulting pulp with water under pressure for a period of time, preferably not exceeding six hours, that will cause the bulk of the nutrients to pass into solution, which constitutes the desired product, and

(d) separating residual solids from the solution and preferably subjecting them to pressure, preferably by passage through rollers, to expel liquid from them.

The extract obtained in step (c) will normally be mixed with the liquid expelled in step (d) to provide the liquid fertilizer product, and this product may be filtered to remove any remaining undissolved solid.

The method of the present invention, at least if carried out optimally, results in a saving of time and heat energy as compared with prior methods and in the maximum amounts of NPK and trace elements being extracted from the seaweed, thus producing from a given quantity of seaweed a maximum amount of high quality liquid fertilizer at a lower cost. Step (a) is of particular significance in preliminary extracting the desired plant nutrients, saving subsequent expenditure of energy in step (c).

In step (c) the seaweed particles are preferably maintained in suspension in the liquid extractant by agitation. The temperature is conveniently in excess of 80°C, preferably 90 to 105°C. The pressure is preferably 50 to 100 psig (446 to 791 kPa), particularly 70 to 90 psig (584 to 722 kPa).

The single figure of the accompanying drawings shows an apparatus for carrying out the production of liquid seaweed fertilizer in accordance with the invention.

In the drawing, a slurry of dried particulate seaweed mixed with at least its own volume and preferably 4 to 8, especially 6, times its own volume, of water is fed from a hopper 11 onto a moving belt 12 which passes it between a pair of pressurized rollers 13. From there it passes via funnel 14, which is fitted with a two-way valve 21, which is shown in its first position by the solid line, into autoclave 15, which is fitted with stirring means (not shown). The autoclave is sealed and the heating then carried out for from 4 to 6 hours at 90 to 105°C and a pressure of about 80 psig (653 kPa).

After heating has finished the vessel and contents are allowed to cool or are positively cooled and the contents, which are in the form of a slightly viscous liquid containing a suspension of undissolved seaweed particles and fibre, are expelled via line 16 by pumping or introduction of compressed air. From line 16 the contents pass back to the belt 12. The liquid spills over it into funnel 14 and the bulk (say 80-) of the residual fibrous and undissolved material passes through rollers 13, which expel surface moisture and dissolved gel from it: these also pass into the funnel. The pressure from the rollers during this operation is not necessarily the same as that during the pre-autoclaving treatment. Scraper blade 19 directs the residual material down chute 17 to a receptacle 18 for disposal. The liquid passes through the funnel 14, which has valve 21 in its other position, (shown dotted) thus passing the liquid via conduit 20 to a storage container 10, from which it can be removed for packaging and distribution.

The two-way valve 21 is linked to the scaper blade 19 so that when the blade is disengaged, i.e. in the pre- autoclaving treatment, liquid passes from the funnel to the autoclave, i.e. the valve is in its first position, and when the blade is engaged liquid passes from the funnel to the storage container, i.e. the valve is in its second position.

CLAIMS

1. A method of producing a liquid fertilizer from particulate artificially dried seaweed, comprising

(a) soaking the seaweed in water for from 2 to 12 hours;

(b) subjecting the soaked seaweed to pressure in order to pulp it and facilitate liquefaction,

(c) heating the resulting pulp with water under pressure for a period of time that will cause the bulk of the nutrients to pass into solution, which constitutes the desired product, and

(d) separating the residual solids.

2. A method as claimed in Claim 1 in which the pressure in step (b) is appplied by rollers.

3. A method as claimed in Claim 2 in which the residual solids, after separation from the solution, are subjected to pressure to expel liquid from them.

4. A method as claimed in Claim 3 in which the liquid expelled is mixed with extract obtained in step (c) to provide the liquid fertilizer product.

5. A method as claimed in Claim 3 or 4 in

which the residual solids are subjected to pressure by being passed through the rollers used to apply pressure in step (b).

6. A method as claimed in any preceding claim in which ther product is filtered to remove any remaining undissolved solid.

7. A method as claimed in any preceding claim in which the particles of seaweed are maintained in suspension during step (d) by agitation of the mixture of pulp and water.

8. A method as claimed in any preceding claim in which the autoclaving is carried out at a temperature exceeding 80°C and a pressure of 446 to 791 kPa for a period of 4 to 6 hours.

9. A method as claimed in Claim 8 in which the temperature is 90 to 105°C and the pressure 584 to 722 kPa.

10. A method as claimed in Claim 8 or 9 in which the pressure is about 653 kPa.

11. A method as claimed in any one of claims 1 to 10 in which the dried seaweed is milled seaweed.

12. A method as claimed in any one of claims 1 to 10 in which the dried seaweed is in granular form.

13. A method as claimed in any preceding claim in which the total volume of water used is from 4 to 8 times the volume of the particulate seaweed.

14. A method as claimed in Claim 13 in which the volume of water is about 6 times that of the particulate seaweed.

15. A method as claimed in Claim 1 carried out in apparatus substantially as hereinbefore described with reference to the single figure of the accompanying drawings.

16. Liquid fertilizer obtained by a method as claimed in any one of the preceding claims.

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ABSTRACT:

CHG DATE=19990617 STATUS=O> A liquid fertilizer is produced from particulate artificially dried seaweed by (a) soaking the seaweed in water for from 2 to 12 hours; (b) subjecting the soaked seaweed to pressure in order to **pulp** it and facilitate liquefaction, (c) heating the resulting **pulp** with water under pressure for a period of time, preferably not exceeding six hours, that will cause the bulk of the nutrients to pass into solution, leaving a residue, and

(d) separating the residue from the solution and preferably subjecting it to
pressure to expel liquid from it. The extract obtained in step (c) is normally
mixed with the liquid expelled in step (d) to provide the liquid fertilizer
product: the pressure in steps (b) and (d) may be applied by rollers.